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ABSTRACT

This article presents the design of a business game as an effective and efficient possibility to introduce results of the latest IT research and expertise into vocational and academic training. A CIO decision framework – in connection with empirical results - constitutes the fundament for this computer-supported game. The "CIO – High Performance Business Simulation", which has already been used successfully for the practical training with students, delivers a realistic insight into the complexity of IT and business management. Furthermore it opens different options for a systematic training on the way to an IT executive. Purposeful communication, assertiveness compared with the other team members and a high level of knowledge are required in order to achieve sustained success with the company in the game. The main building blocks, design concepts and criteria for the transformation of the theoretical demands into a business game are pointed out in this article.

Keywords

Computer-supported business game, CIO decision framework, IS Education

INTRODUCTION

A main objective of IS master courses consists of preparing students for a managerial position in the IS occupational area. In order to address this aim two questions have to be answered. The first one is a pure research question, whereas the second one is more of didactical concern.

The research question asks for the tasks and responsibilities of CIOs and IT executives and the decision context in which they have to make their decisions. Answering this research question means to uncover long term questions as well as to look beyond hype waves that the IS discipline is obviously exposed to in order to extract core problems and issues which CIOs face and required skills and knowledge. With the second question one looks for an effective and efficient way for teaching the required skills and knowledge.

With the developed IS business game both questions are answered iteratively by connecting education and research by feedback loops. Hence, in this paper we argue that an IS business game is a well suited medium for teaching students and prospective IT managers. Moreover it provides a platform in order to get feedback from students, CIOs, as well as from consultants. Furthermore, we describe the elementary building blocks of an IS business game which meets empirical observations as well as theoretical knowledge and provides the basics for further enhancements and adjustments.

The remainder of this paper is structured as follows. In the next section we shortly discuss the research and evaluation strategy and data collection methods that this research is based on. Subsequently the theoretical background and requirements for the IS business game are presented. In order to achieve this, the CIO decision framework (CDF) is derived. The third section provides the argumentation for using a business game and introduces the main building blocks of the IS business game that meet the requirements of the CDF. We conclude with a summary and an outlook on further research.

RESEARCH METHODOLOGY AND DATA COLLECTION

Developing an IS business game means designing an artifact. Therefore this research relies on the design research paradigm such as it is discussed by Simon (Simon, 1996) and March/Smith (March and Smith, 1995). Design research means iteratively going through the steps gaining problem awareness and defining the problem, suggesting a solution, developing the artifact, evaluating the artifact and finally draw conclusions (Takeda, Veerkamp, Tomiyama and Yoshikawam, 1990). However, designing an IS business game is also strongly connected to CIO research. CIO research asks for responsibilities, tasks as well as decision situations of CIOs and the context in which CIOs have to act and make their decisions. Obviously, suchlike research follows the behavioral science paradigm such as it is described in contrast to design research by Hevner/March/Park/Ram. In order to relate CIO research to designing the game we use the CIO Decision Framework (CDF) which describes tasks and responsibilities, context parameters and the goals. Figure 1 depicts the connection between the four building blocks CIO research, CDF, IS business game and its usage in IS education. Empirical data and theory is provided by the CIO research for the CDF which defines the requirements for the IS business game. The logic of the IS business game is represented in the Systems Dynamics modeling language that relates variables to other variables such as levels (stocks) and flows in a numerical way. Interestingly, the modeling process has turned out to be a really good generator for new research questions for our CIO Research. This is the first feedback loop. In order to introduce the IS business game in IS education a didactical concept and a guide for lecturers has to be developed. This is not fully completed yet. However, first experiences from usage in education show that questions of master students provide a second feedback loop for improving the game and as a starting point for further knowledge transfer to the students.

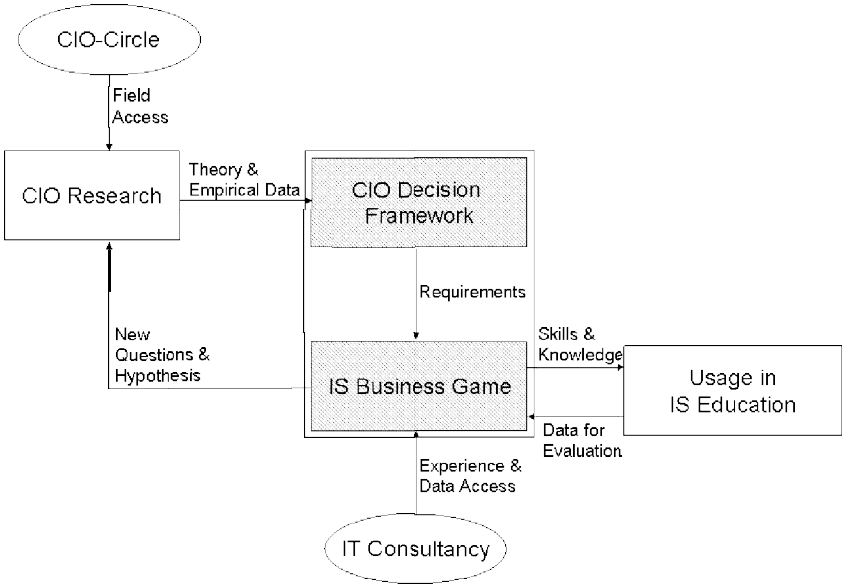

Figure 1. Building Blocks of the Research

Since it is extremely difficult to gain a regular access to CIOs and other IS executives for research purposes we tried to break new ground by initiating a community of practice for CIOs - called the CIO-Circle – in order to ensure a long-term and regular field access to CIOs and IT executives. The CIO-Circle provides a platform for collection of data by participating observation, narrative interviews and surveys. Besides the field access to CIOs, the IS business game has been designed in cooperation with a large IT consultancy in order to exploit the experience of IT strategy consultants.

CIO DECISION FRAMEWORK

Dimensions for the Framework

Malik (Malik, 2000) defines the management function as setting goals and visions, making decisions, organizing, controlling, and developing the work force. In a nutshell, management means making decisions and finally decision making means evaluating relevant alternatives. Therefore, in order to identify relevant dimensions for the framework the three dimensions of evaluation have to be considered. Firstly, the relevant attributes of the decision object have to be described. Secondly, the evaluation of the decision object is done with respect to objectives. Thirdly, evaluation depends strongly on the context. The relationship of these three dimensions determines the value of an alternative.

With respect to the evaluation dimensions in the CDF four dimensions are distinguished and defined. The first dimension is the "Decision Maker Dimension". The second dimension is the "Decision Object Dimension". The third one is the "Objective Dimension" and finally the last one is the "Context Dimension". In the remainder of this section these four dimensions are briefly described.

Decision Maker Dimension

The definition of the term CIO and the description of his managerial responsibilities and functions are currently not uniform. Moreover there are substantial differences of the CIO concept and the CIOs' managerial functions in different countries. While CIOs in US corporations are often only responsible for information systems, CIOs of German corporations have frequently much more responsibilities and managerial functions, for instance controlling or accounting (Heinzl, König and Hack, 2001).

Perhaps the most frequently used CIO definition is Synott's one. He defines the CIO as "…the highest ranking executive with primary responsibility for information management" (Synott, 1987). Synott's definition contains a strong reference to the hierarchical position. Boyle and Burbridge define the CIO in the same way, but more detailed: "We define CIO as an executive with broad responsibility for information technology (e.g. data processing, telecommunications, and office automation who reports to a high-level corporate officer (e.g. president or CEO)" (Boyle and Burbridge Jr., 1991).

In addition to their definition Boyle and Burbridge provide a classification of several managers who are responsible for technology (Boyle and Burbridge Jr., 1991). They use the two criteria reporting level in company and responsibility for technology. They denote a manager, who has a broad IT responsibility but reports to a low hierarchy level, with the term "emerging CIO". A manager with a narrow responsibility for technology and a low reporting level is referred to with "IS manager".

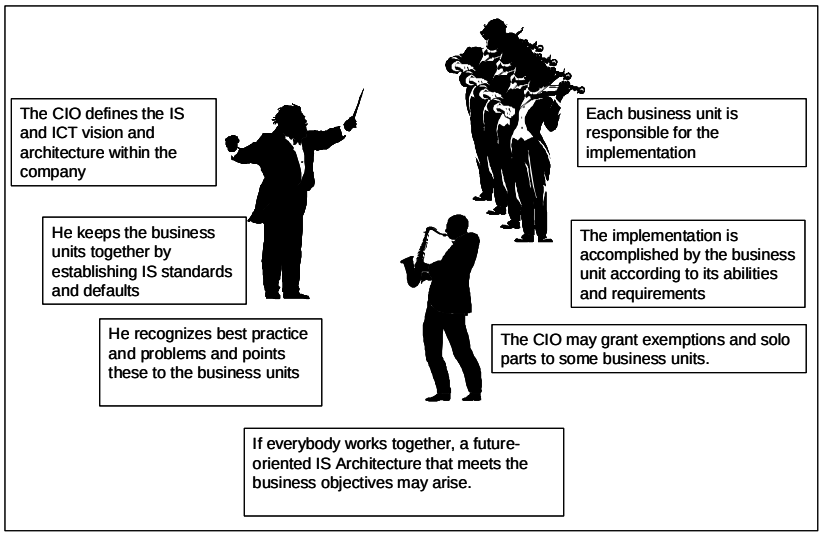

Figure 2. The CIOs' role and managerial functions

Earl and Vivian (Earl and Vivian, 1999) identify twelve different occurrences of the CIO role, which can be assigned to the dimensions technology focused, business focused or organizationally focused. They found that the most important occurrences are the so called technology policy-maker, the functional leader, the system strategist, the service deliverer and the change master.

The magazine "Insight CIO" presents another survey with 400 CIO and IT Managers of US companies (Alter, 2003). This study reveals a growing tension between the CIOs' strategic aspirations and the bean-counting reality. Furthermore it shows a discrepancy between their own sense of their primary roles and their bosses' view.

In order to avoid a strong reference to the hierarchical status we define the CIO as follows: "The Chief Information Officer (CIO) is the job title of a person or manager who is responsible for the Information and Communication Technology (ICT) and the IS Architecture that supports the business objectives."

Furthermore the role of the CIO can be described in terms of an orchestra and a conductor. The conductor represents the CIO, the orchestra stands for the business units. The conductor chooses the composition, keeps the musicians together, corrects mistakes and is responsible for the sound. Nevertheless each instrument plays its role and moreover some instruments may have solo parts. Figure 2 illustrates this allegory.

Decision Object

In order to identify decision objects, a model of IT management is required. The IS business game is based on Krcmar's (Krcmar, 2004) model of the information management's responsibilities and functions. The responsibilities and functions are depicted on four layers: the management of the information logistics, the management of the information systems, the management of the information and communication technologies as well as the managerial functions of information management. The latter one contains the overall governance and controlling responsibilities with respect to the other three layers.

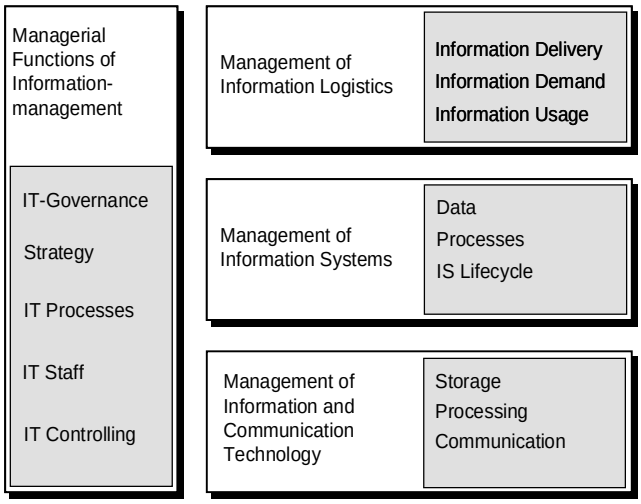

Figure 3. Model of the Information Management (Krcmar, 2004)

Object of the information logistics layer is the resource information itself. On this layer decisions about information supply and information demand and therefore about the information usage have to be made.

Information Systems are coordinated human, organizational and technical elements which target at information demand. Objects on this layer are applications - their elements and their life cycle - as well as the information systems portfolio. This layer defines requirements for the underlying information and communication technology layer (ICT layer).

The ICT layer describes the management of storage, communication and processing technology. Hence from a structural perspective IT infrastructure can be defined as the hard- and software which is required for storage, communication and processing as well as the human resources which are required for the build and run processes. From a more usage oriented perspective IT infrastructure can be seen as a portfolio of IT services. It is an integral property of IT services that they consist of technical elements as well as of organizational elements. Moreover, effective and efficient customer integration is seen as a crucial part of IT services. Based on an empirical survey Weill et al. distinguish as many as seventy services. These services can be subsumed into ten service clusters, for instance IT facilities management, data management, communication etc. (Weill, Subramani and Broadbent, 2002).

Objective Dimension

CIOs make decisions about the decision objects in order to meet business goals. For this purpose, fundamentals can be drawn on the balanced scorecard (BSC) concept of Norton/Kaplan (Kaplan and Norton, 1992). The BSC exhibits in its original form four perspectives: the financial perspective, the customer perspective, the internal processes perspective and the learning and growth perspective.

The four perspectives of the BSC can be translated into four formal economic goals. The customer perspective relates to the question "are we doing the right things" and therefore to the goal effectiveness, the internal process perspective to the question "are we doing the things right" and therefore to the goal efficiency, the financial perspective relates obviously to the question if the monetary evaluated output justifies the monetary evaluated input and the growth perspective relates to question how sustainable is the success. Additionally to this four perspectives, managing risk and compliance gains more and more in importance. This gain in importance is last but not least due to national and international laws and agreements, such as Basel II, Sarbanes Oxley Act and UN-Resolution 1390/2002. Therefore it seems to be reasonable to add a fifth perspective that considers risk explicitly.

The CIO has to act and decide within this five perspectives profitability, effectivity, efficiency, sustainability and risk as it is depicted in Figure 4. With respect to the CIO, effectivity translates to the question "does IT support the relevant business processes appropriately", efficiency translates to the question "are the internal processes appropriate", sustainability asks for the potential of IT and profitability for its monetary contribution.

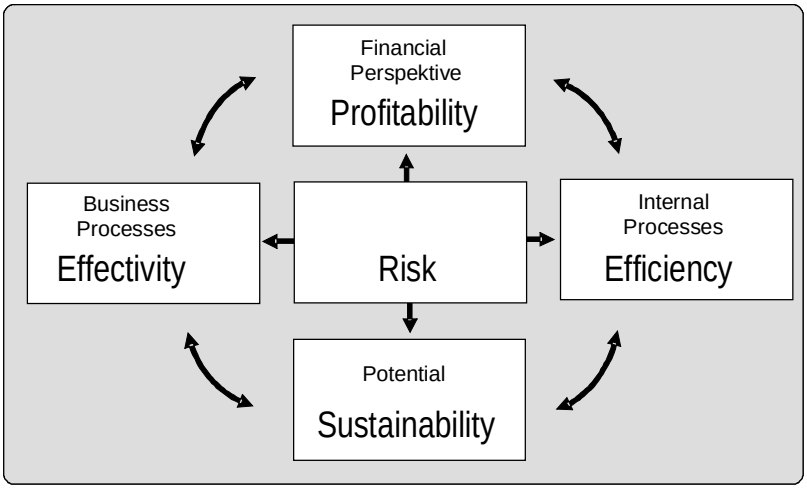

Figure 4. Objectives for the CIO

Context Dimension

The context dimension describes all the endogenous conditions and developments that CIOs are exposed to. Thus the context dimension is strongly connected to empirical observations and data and is the most volatile part of this framework. Some aspects of the context which are relevant for the design of the business game could be extracted by using narrative interviews with CIO-Circle members. Moreover workshop documents from the CIO-Circle could be analyzed.

The first crucial point that CIOs have to handle is that there is rarely a direct impact of IT on the business value and that this impact is hardly measurable. Therefore often feedback of success or failure is diffuse or fails to appear completely. Nevertheless, IT is strongly linked to business processes and business strategy as it is depicted in figure 5. Therefore CIOs need skills to see the whole picture, to understand business processes and complexity as well as good communication and marketing skills in order to place their ideas and visions and to argue for the value of their IT. This first point relates to the second point that although meanwhile CIOs report in most of the cases directly to the CEO the CFO's position is frequently much stronger.

The third point is that currently a tendency towards the efficiency goal can be observed. This means that cost cutting still a task for CIOs. Hence CIOs have to permanently look for room for improvement of internal processes and outsourcing alternatives. The fourth point is although often short term goals and request for quick wins prevail decisions about IT generate path dependencies und have log-term effects, which are sometimes even counterintuitive.

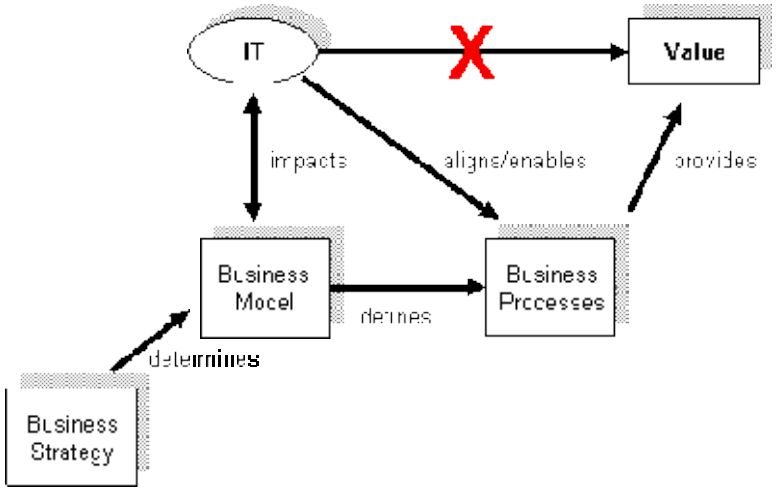

Figure 5. Relation between value and IT

TRAINING OF COMMUNICATION AND IT DECISION MAKING USING BUSINESS GAMES

How can it be managed to prepare students or prospective executives to train and assume the responsibility for strategic decisions in their future professional life?

Traditional learning scenarios provide the learner with necessary expert knowledge, however they mostly lack in the impartation of understanding the complexity of companies and their organizational structures or specific decision training for problem solving (Reinmann-Rothmeier and Mandl, 1999). Also the knowledge transfer to real life situations only seldom succeeds (Mandl, Gerstenmaier and Bangerter, 2000).

One effective way for the instruction of sustainable and future-oriented decision making is the work with realistic business games. These types of strategic game follow the constructivist paradigm with ideas like problem complexity, linked learning contents and a generated learning format, which are suggested to create meaningful learning environments (Cognition and Technology Group at Vanderbilt University, 1992). The learners become part of a simulated company environment and learn how to deal with highly complex processes and systems. By this means they get enabled to prove more efficient communication and organization structures and enhance or sharpen their social competence through modified social patterns of behavior (Kriz, 2001).

Business games – originally used for the prearrangement of warlike operations (Kern, 2003) – have established themselves very much also for the training of decision making in the context of business management during the last decades. At present about 450 business games are situated in the German-speaking market (Windhoff, 2001).

Zack (Zack, 1998) notes that reaching a practical level of knowledge about systems integration requires a sufficiently complex real-world environment. In his opinion simulations of the real world are a good choice, because sending students to the field offers realism, but lacks of control over content, context and timing of the experience. This often results in problems. With the help of simulations the students learn not only about the technical material but also human relationships, communication and collaboration skills.

THE CIO – HIGH PERFORMANCE BUSINESS SIMULATION

The business game "CIO-High Performance Business Simulation" (CIO–HPBS) is a strategic game which deals with the complex interrelationships of IT decisions and corporate strategy. The CIO-HPBS represents a way to realize the aforementioned challenges for the CIO in the entire company in a didactical context.

For this business game particularly the following aspects have been integrated

- Holistic view on a company with a high impact of information technology
- Distinctive role concept with possibility for role reversal
- Encouragement of the communication between the learners

- Multidimensional assessment of every role through a balanced scorecard
- Different decision dimensions with projects and single ratios

Holistic view on a company with a high impact of information technology

The business game "CIO – High Performance Business Simulation" enables the student group to immerse into the role of the corporate management of a car bank. This company, the "TechniCar Autobank" is based on the constitution and organizational structure of a real car bank. The players make their decisions in an interval of (virtual) six months respectively for the next planning period.

The bank deals with two different products:

- *Car Financing:* the customers can finance their new car at the TechniCar Autobank
- *Customer Savings:* the bank offers the possibility for private customers to bank their money at the car bank

Both products are processed internally each with three different process steps: "Sales & Marketing" offers information and consulting to potential customers. Possible later contracts are also prepared in this step. The "Origination" department is responsible for the contract settlement. Contract customers are handled in the process step "Servicing".

The *finance department* concentrates on planning of the financial statement and the cash management. Because of the six-months time gap between the game rounds the CFO has to manage a very foresighted strategy and budget all alterations of the companies financial situation in the future. A special importance is attached for the planning of the cash. If a large quantity of cash remains in the company during one game period, possible interest profit disappears. Otherwise – an insufficient cash situation results in the borrowing of money from the central bank with a high payment of interest.

The *marketing department* is responsible for the management of general and product-related marketing campaigns. Moreover - and in conformance with the financial department – the interest rates for the products have to be set. In the current market of the game twenty car banks are represented in total. The TechniCar Autobank is the only one actively modified by real players. Alterations of interest rates or marketing budget however have an impact on potential new customers through different ratios between TechniCar and its competitors.

Every organizational unit is supported intensively by information systems. Here the business model differs between central and decentralized components. Whereas the servers and the required system software are utilized for the entire bank, the business applications, desktops and office software are treated separately for every part of the company. According to the individual circumstances and the project situation every IT component works more or less effective and efficient. Additionally the age and variety of the IT components are considered in the game.

The implementation of IT-supported projects and the maintenance of the hard and software components are tasks of the *IT department*. Depending on the allocation of resources from the responsible game role the performance and availability of the entire system runs stable or declines as consequence of an undersupply.

Distinctive role concept with possibility for role reversal

The four players of one group assume the roles of the CIO, the CFO, the CMO and the COO and therewith the responsibility of decision making for all essential parts of the company.

- The CIO makes his decisions about projects and business ratios about the entire information technology of the TechniCar Autobank. Moreover he takes the full responsibility for the IT human resources.
- The financial analyses and the planning of the financial statement and cash have to be accomplished by the CFO. He also fixes the budget of the remaining team members.
- The CMO handles the corporate marketing strategy, the marketing budget and the employees of the marketing department.
- The product and process management has to be managed by the COO.

The restricted field of action for every role – referring to the entire company – in many cases results in conflicts between the C-level managers because of different targets or a budget which does not suffice the individual strategic planning. Such discrepancies understandably can only be solved with clear communication structures and constructive discussions within the team – absolutely similar to the real company situation.

During ten to twelve game rounds the roles can easily be reallocated to give every player a realistic insight into the thinking and decision structures of the other members of the corporate management. Thus the players have the chance to understand the argumentation and individual problems of each other and reflect their situation.

Encouragement of the communication between the learners

For many CIOs communication skills represent – above technological know how or business understanding – the most important basis for a successful standing in the top management of a company (Berkman, 2002). Therefore exchange and discussion between the different roles is one of the main elements in the business game.

Already after the first round the team members together compose a strategy paper to outline their vision, their direction of impact, important business ratios and strategic goals for the whole company. During the game every role has to argue and enforce their decisions opposite to the residual top management to reach demonstrable goals. In the end every group has to present the progression and the output of the teamwork like a report to the CEO.

In the management team the CIO has to suffer also from a very special situation: for the CFO the IT often appears as a cost driver. In contrast the positive financial outcomes of the IT support - in turn - the CFO perceives as his own benefit.

Multidimensional assessment of every role through a balanced scorecard

Balanced Scorecards are an effective and integrated concept for the performance measurement in business games (Dickinson, 2003).

Therefore the current situation of the company is presented with individual balanced scorecards to the playing team. The management roles thereby reach a holistic view on their work and are not restricted to a very few number of business ratios.

Because of the high impact of IT in the car bank the game "CIO – High Performance Business Simulation" uses a five-dimension balanced scorecard with "Client Management", "People Development", "Process Management", "Finance Management" and "Technology". Figure 6 shows a part of the user interface with the balanced scorecard for the CIO.

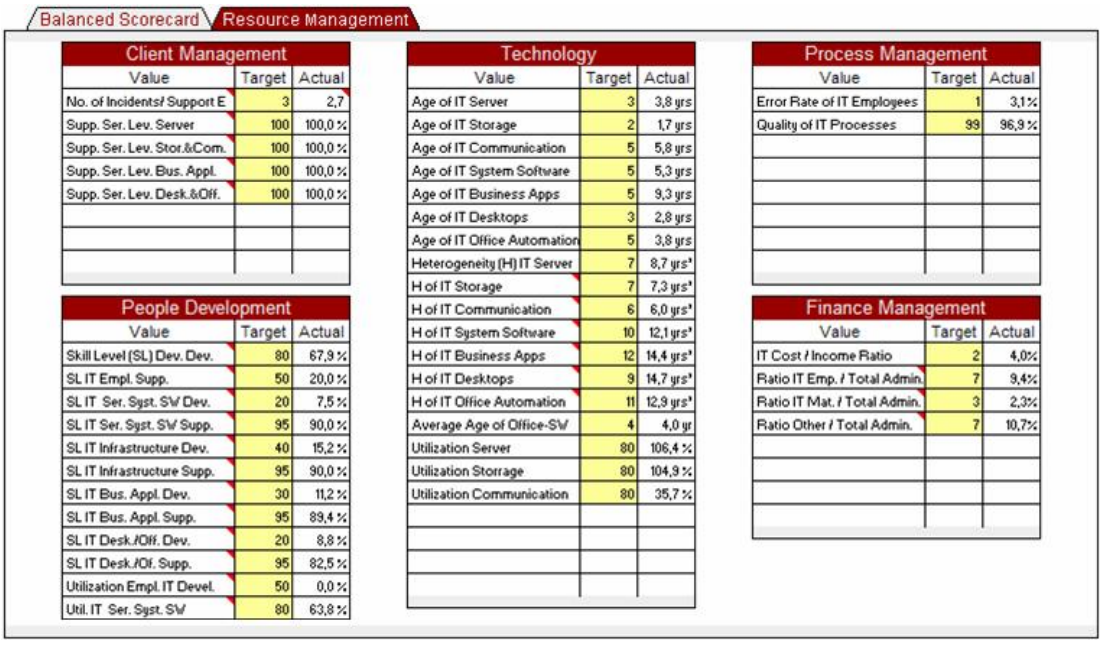

Figure 6. The balanced scorecard of the CIO

Different decision dimensions with projects and single ratios

The fields of decision for every role can be divided into two main parts:

- Manipulation of single values or business ratios (e.g. hiring of new employees)
- Selection and initialization of projects

All the possible projects are listed in one special part of the user interface, the project repository. Every project has a detailed requirements catalogue to run it successfully. The projects are structured in IT projects, process projects, strategy projects or marketing project.

By contrast the expected positive outcome of every project is only outlined approximately because – as in a real company – it is impossible to appraise all supposable interactions between the different projects and the entire company.

Figure 7 shows one sheet of the project overview from the "CIO – High Performance Business Simulation"

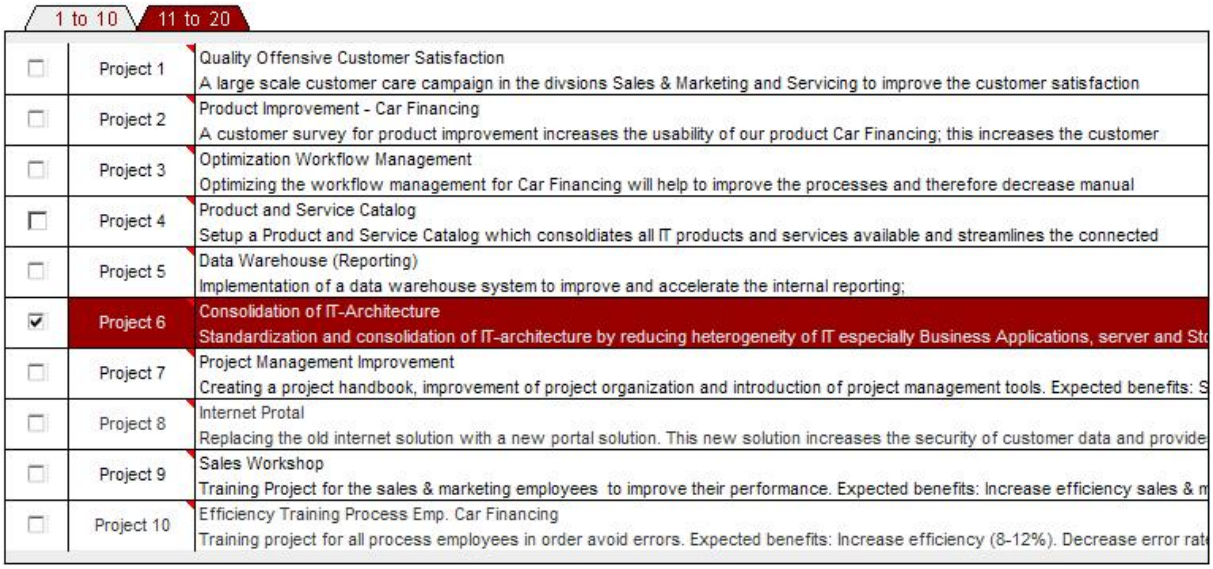

Figure 7. The project overview

Every project is divided into an implementation phase and a runtime phase. The implementation phase only wastes resources whereas the following runtime phase reveals the positive effect of the project for the company.

The decision to start a project is difficult due to following reasons:

- Projects have a longer implementation phase than one round. Therefore every project has to be planned in the long run.
- Many projects concern more than one management role and have to be planned from the entire management team.
- Incorrect planning of resources does frequently influence the whole firm and hence other managers.

SUMMARY AND OUTLOOK

In this paper we introduced a CIO decision framework in order to provide a theoretical foundation of the developed IS business game. The business game is designed in order to address this framework.

Although summative evaluation of the business game's success still takes long time. However, first experiences with the business game in education and a first formative evaluation show a positive tendency. After the completion of the first game we used an online questionnaire with additionally text fields for suggestions for improvement. About 30 of our participating master´s degree students filled this questionnaire to evaluate their experiences with the simulation.

This IS business game might be an efficient and effective way in order to teach necessary skills. It is also a good starting point for further knowledge transfer. For instance questions of students could be used as origin to explain and discuss economic theories and models.

Since the game is only in its first version, in the next step it will be enhanced in several ways. For example in the next version it will be possible for the players to allocate budgets and not only start and stop projects but also dynamical allocate resources to projects.

It will be a further interesting approach to use the simulation core of the game for carrying out simulation experiments in order to generate new hypotheses and models. The game can also be used as an experimental laboratory for conducting experiments with students and mangers in order to test hypotheses.

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